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THE FALCONBRIDGE GROUP



CORPORATE OPERATION STUDY

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**MINING  
IN CANADA**





## FALCONBRIDGE

**FALCONBRIDGE: A STUDY**

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**Illustrations** of Falconbridge operations in the study are intended to show something of the scope of the group, rather than concentrating on the main nickel operations.

☐ **Cover photo** shows a general view of the main centre in the Sudbury Basin of Ontario

## FALCONBRIDGE



Members of the Company's Staff Executive Committee, shown on the facing page are (left to right): H.L. Hickey, Manager—Public Relations; P.N. Pitcher, Vice-President—Minerals Division; E.L. Healy, Vice-President—Nickel Division (and Director of Mining Engineering and Research); G.T.N. Woodrooffe, Vice-President—Finance and Secretary; H.J. Fraser, President and Managing Director; W.G. Dahl, Vice-President—Marketing; G.P. Mitchell, Director of Exploration and Geology; R. Campbell, Executive Vice-President; and F.R. Archibald, Director of Metallurgy and Research. (Absent at time of photo was G.S. Jewett, Vice-President—Corporate Affairs).





# FALCONBRIDGE

## NICKEL MINES LIMITED

Canadians are not known to be overly boastful about their assets, and mining companies tend to border on conservatism in telling their stories. As major income producers for Canada from export revenue, they have an unusual record of achievement. To illustrate the strength and scope of the mining industry, *Mining in Canada* is pleased to present a study on Falconbridge Nickel Mines as the first in a new series to emphasize the vital role of the industry in Canada's growth.

by Roger Guimond





Horace J. Fraser, President of Falconbridge, works from the head office at 7 King Street East, in the heart of Canada's mining capital, Toronto. Fraser, geologist, former professor and World War II Foreign Economics Administrator in Washington, D.C., was brought into Falconbridge in 1945 and took over the chief executive position in 1958 when Thayer Lindsley retired from the presidency.



As Executive Vice-President, R. (Reg) Campbell (at his desk) plays a key part in administering the complex affairs of the growing Falconbridge organization. Standing is Corporate Affairs Vice-President G.S. Jewett, who was involved in the detailed negotiation of major stockpile contracts in the 1950s. G.T.N. Woodrooffe, Vice-President—Finance and Secretary, is closely identified with financial aspects of the far-ranging Falconbridge group of companies.

#### FALCONBRIDGE



## FALCONBRIDGE SECRET: *TALENT*

When Ventures Limited was incorporated into the Falconbridge group in 1962, the company, as a Canadian mining corporation, no longer existed. However, the spirit which enabled Ventures to contribute to the development of the country's mining industry continues in the Falconbridge organization. But it is to Horace Fraser's credit that in picking the men to run the new organization he was able to bring together the best of Ventures and Falconbridge. An important sidelight on the assimilation of those from the former group is reflected by the prestige connotation "he's a Ventures man", the use of "Ventures" indicating a combination of the independence and the daring of an older generation of mining men and developers endowed with the thinking of the scientifically trained person.

#### Bonds of Co-ordination

The organization, today, is an inter-relationship of management and technical groups within the Nickel Division which extends out to the associated companies through the Minerals Division. There has been built a small administrative head office staff which has strong coordinating linkages with local management at the various operations and laboratories. The aim is: maximum individual responsibility and a strong organizational structure through bonds of coordination.

The diversity of talent resulting from the acquisition

of the mines producing a variety of metals and minerals has been an invaluable source of professional and technical wealth and Fraser is seeing that this tremendous asset is not being wasted. Possibly a leftover from the days when the chief executive was a professor of geology, there is a strong indication that more accent is placed on research and professional upgrading at Falconbridge than at other mining companies with a comparable income.

#### Research emphasized

There is a tradition of emphasis on research in the Falconbridge group that leads back to the early enthusiasm of Thayer Lindsley and his realization, many years before the idea was generally accepted, of the great importance of doing basic research and development work as a backing to the future progress of the industry.

In 1941, the only plant capable of producing uranium metal in quantity was that of Metal Hydrides, in Massachusetts, a Thayer Lindsley project. In 1942, F.R. Archibald, now director of metallurgy and research for Falconbridge, went to Metal Hydrides as chief engineer to organize production in quantity, and it was from this operation that the fuel for the historic Fermi reactor in Chicago was supplied.

Management considers that the heavy accent on





F.R. Archibald, Director of Metallurgy and Research (leafing through a report), co-ordinates the many-pronged scientific approaches to operations from processing efficiency to product development. A strong marketing and sales organization, second to none, is the aim of Marketing Vice-President W.G. Dahl, shown here emphasizing a point.



As Vice-President of Minerals Division, P. N. Pitcher's latest mine-making project is the \$40-million iron ore Tasu Mine. Seated in front of him is E. L. Healy, Vice-President—Nickel Division, responsible for co-ordination and expansion of nickel production and development of Strathcona Mine. Looking thoughtful is G. P. Mitchell, (left) Director of Exploration and Geology, who travels a wide area as he oversees his world-ranging geological teams.

**Strong bonds** of co-ordination are needed because the operations are widespread

**A policy** of good liaison and technical upgrading has proved invaluable

research has already paid off through improved mining methods, more efficient processing and improved nickel products. The latter, an important competitive approach, is being reflected by the inroads Falconbridge is making in the US market.

#### **Company symposium**

Operationally, the best possible use is being made of the knowledge of engineers, metallurgists and geologists connected with the various mining properties. Best indication is the recently-held week-long company mining symposium. Projected as an annual affair, the purpose is to discuss freely among each other some of the problems with which they were faced and the remedial action taken. The purpose: if the problem still exists, a possible solution could be arrived at through an interchange of information.

Still on the interchange of technical know-how, a new department, Mining Engineering and Research, has been organized to provide full service to all operating companies in the Falconbridge group. It is expected that this type of service, directed from the head office, will assist in mines obtaining continued improvements of methods, layouts and equipment which will lead to greater productivity, fuller utilization and extension of ore reserves, greater rates of production and consequent higher mine profitability in the future.

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**The Staff Executive Committee** meets twice monthly under the chairmanship of company president H.J. Fraser. The group reviews and discusses activities of the Falconbridge organization and arrives at management decisions. Matters are often brought before Staff Executive meetings for detailed discussion before going on to the Board of Directors for major policy decisions.

Other senior committees meet at regular intervals to review and discuss technical and operating matters of the Nickel Division and the Mineral Division, under the chairmanship of the respective vice-presidents, E.L. Healy and P.N. Pitcher.

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FALCONBRIDGE



## THE EARLY YEARS

**Ventures Limited**, once the parent of Falconbridge among very many other projects, was eventually taken over by its offspring.

**Before the final merger**, in 1962, the practical reorganization of what is now the Falconbridge group had started.

**A key factor** in the growth of the nickel operations was stockpile contracts negotiated with the US government

Falconbridge Nickel Mines Limited, a product of the old Ventures organization, continues to look better with each passing year. Its latest consolidated earnings, \$27,725,000, or \$5.66 per share, are the highest ever recorded. Metal sales and other operating revenues showed a sharp increase to \$92,495,000 from \$82,840,000 in 1965.

Principal factor in the earnings rise was a \$6,266,000 increase in dividends received from partially-owned subsidiaries, from \$11,545,000 in 1965 to \$17,811,000 last year. Total dividends received by Falconbridge amounted to \$21,699,000, representing 78.3 per cent of the company's reported 1966 net earnings, compared with 57.7 per cent in 1965 and 40.5 per cent a year earlier.

Exactly 30 years ago the net profits of Falconbridge were \$1,873,607—a far cry from the most recently published figures.

What helped move Falconbridge into position as Canada's and one of the world's principal mineral producers was a combination of factors—a large US government stockpile contract, a merger, an unusually aggressive management team put together by Horace Fraser, and increasingly good markets for metal, principally nickel.

### A spectacular beginning

Surprising as it may seem, Falconbridge is a comparatively young company, and many persons still recall when Ventures Limited was incorporated in early 1928 with Thayer Lindsley its first president. In August of that same year, Falconbridge Nickel Mines Limited was organized as a subsidiary for the purpose of developing recently acquired nickel prospects in Falconbridge Township in Sudbury, with Ventures receiving stock in the company for its cash advance. (At one time Ventures held 75% of Falconbridge.)

The original property, on which were outlined 5,-

700,000 tons of nickel-copper ore, was purchased for \$2,500,000, the highest price ever paid for any ground in the Sudbury district. The company's holdings were further protected by the staking of large areas of adjoining territory which brought Falconbridge's holdings to 7960 acres and ensured the company's expansion far beyond anything then anticipated.

Lindsley had other thoughts, and through another associated company, Sudbury Nickel and Copper Company Limited, eventually acquired properties along the rim of the Sudbury Basin which considered to be one of the world's more remarkable geological structures. This eventually involved many thousands of acres besides the acreage held by Falconbridge. Falconbridge eventually safeguarded its position of ore supply by buying other the holdings of Sudbury Nickel and Copper Company Limited and even assured more ground in the succeeding years by further staking.

The whole undertaking was an imaginative one and in retrospect could be viewed as the forerunner of other fully interlocking mining complexes developed in various parts of Canada in later years.

Coinciding with ground acquisition, mine development, smelter construction, and townsite development, an important move was the purchase of the Kristiansand nickel refinery in Norway. Later operated under the name Falconbridge Nikkelverk Aktieselskap, it not only made the organization completely integrated from mine to market, but gave a competitive advantage of a European market for nickel and other metals.

The smelter at Falconbridge, blown Feb'1930, that year treated 71,626 tons of ore for some 80% nickel plus copper matte. For the ores that could not be treated by direct smelting, a concentrator and sintering plant was constructed which increased daily tonnage fed into the smelter from 544 tons to 779 tons.

By the end of the fifth year, despite the many drawbacks created by the depression, the company showed a net profit of \$1,122,999. By the end of 1936, net sales from 11,226,108 pounds of nickel and 4,005,902 pounds of copper were \$5,178,812, with net profits of \$1,873,607.

The activity that has taken place during and since the Falconbridge-Ventures Limited merger, were a treatise written on the change, could easily be termed a guide to students of corporation management.

**Consolidation**, begun in 1959, the year after Fraser became president, can be described as "a flighty parent brought to task by a realistic offspring." At the time of the merger, Ventures was a conglomeration of over 150 companies, subsidiaries and sub-subsidiaries put together by Thayer Lindsley. Lindsley had a habit of picking up likely looking properties as an art lover



collects paintings, and among his many descriptive titles, could be added that of "North America's exploration genius."

Falconbridge was then the most remunerative subsidiary in Ventures, and when Fraser took over as president of both Ventures Limited and Falconbridge Nickel Mines Limited, one of the first tasks he undertook was to pick out his men. Then they were asked to do a complete report on the companies within the Ventures organization. Subsequently, in a number of drastic moves, some properties were sold, some companies retained and others combined.

There is a misconception that consolidation of the Ventures operations took place only after the Falconbridge-Ventures merger. Decision to streamline goes back to 1957-58, at which time many months were spent in property evaluation.

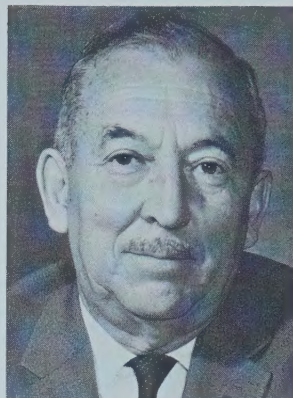
The main part of the program of corporate simplification began in 1960. Most important was the merger of Frobisher Limited with Ventures whereby all the assets of Frobisher and 250,000 dollars in cash were acquired in exchange for 300,995 treasury shares of Ventures. The result of the merger was that Ventures became the large single shareholder in Giant Yellowknife Mines Limited, United Keno Hill Mines Limited, and Kilembe Copper Cobalt Limited. . . as well as in a number of companies of a smaller financial stature.

The next major move was that of Consolidated Sudbury Basin Mines Limited when it amalgamated with Giant Yellowknife Gold Mines Limited in June 1960 and became known as Giant Yellowknife Mines Limited. Hoyle Mining Company Limited became a substantial shareholder of Giant in November of that same year. Ventures then purchased for \$3,431,134 all the assets of Hoyle including its share holdings in Opemiska, United Keno, and Onaping. The net effect of these transactions was that Ventures received 1,549,710 shares of Opemiska and 154,971 shares of United Keno, 89,813 shares of Giant, and other miscellaneous shares including those of Onaping.

Other transactions are worthy of mention. At a later date Ventures sold its entire holdings of International Titanium Corporation, and at the end of the year its entire holdings of Frobisher Limited. Ventures received shares of Alminex Limited on a distribution of assets of Geoil Limited and on the merger with Frobisher. As a result of the mergers and purchases for cash Ventures increased its holdings in Anyox Limited, which became a wholly-owned subsidiary, Quebec Metallurgical Industries, Dominion Magnesium Limited, and a number of other lesser mining companies. In additional smaller moves, more than ten other companies were financed or reorganized, or eliminated through the sale of shares or winding-up procedures.

**The net results** of the many changes made in 1960 are that Ventures became the major controlling shareholder in some sixteen active operative or holding companies, as well as in seven others which were not then active. In the sixteen companies, the Ventures ownership was then mostly direct. Ventures holdings of Falconbridge accounted then for over 50% of the value of the Ventures' portfolio and therefore a major source of Ventures income.

By July, 1961, a plan of merger with Ventures was approved in principle, and the changes were made six months later in January of 1962. Also involved was the sale of a block of treasury shares of the revitalized company to McIntyre Porcupine Mines Limited. Here it must be recalled that there has been an association



**Falconbridge pioneer:** R.C. ('Shorty') Mott, formerly Vice-president—Operations, retired at the end of 1966 after 39 years service with the Falconbridge organization. He is continuing his association with the company as a consultant. His close friend and business associate, R.M. (Ron) Oliver, formerly General Manager—Nickel Division, passed away in 1966 after 38 years service.

with McIntyre. Both John Barrington, president of McIntyre Porcupine Mines Ltd., and the late F.V.C. Hewett, formerly a president of McIntyre, had held the presidential offices in Ventures before Horace Fraser.

The merger with Ventures Limited, together with the accompanying sale of treasury stock to McIntyre Porcupine Mines (280,600 shares for \$17,405,618) altered the character of the company and further strengthened its financial position. It also increased the number of shareholders from 6,000 to 13,000. (Today there are 13,976 shareholders, of whom 10,157 are of Canadian registry, holding approximately 79 per cent of the outstanding shares.

#### **New assets**

Prior to the merger with Ventures, Falconbridge was primarily a nickel-based operation and the world's second largest nickel producer. Its largest single source of revenue is still from its principal mining operations and the smelter located in the Sudbury area where smelter matte containing nickel, copper, cobalt, and precious metals is produced and sent to Norway for refining. With reorganization, its stock interests in the newer operations now brought the company additional dividends and income from wholly owned and associated companies which produce such commodities as copper, gold, silver, lead, zinc, oil and gas, metal powders, iron ore, nepheline syenite, silica, and other products related to natural resources and extractive industries.

The assets acquired on the merger included effective controlling interests in Alminex Limited (oil and gas); Anyox Metals Limited (iron); Dominion Magnesium Limited (magnesium); Industrial Minerals of Canada (nepheline syenite); Kiena Gold Mines Limited (gold property); Kilembe Mines Limited (copper); Lake Default Mines Limited (a then undeveloped copper-zinc property); La Luz Mines Limited (gold and copper); Metal Hydrides Incorporated (metal and chemical hydrides); Opemiska Copper Mines (Quebec) Limited (copper); United Keno Hill Mines Limited (silver, lead, zinc); and Giant Yellowknife Mines Limited (gold). A couple of holding companies were also retained for good measure and kept in good standing because of their potential usefulness.



FALCONBRIDGE



## THE NEW FALCONBRIDGE

The first five years as an expanded organization after the acquisition of the assets of Ventures Limited have been good to Falconbridge. The exception was 1963 when the company found itself, for the first time in a decade, without US stockpiling deliveries; which resulted in a drop in corporate earnings to \$14,286,000 or \$2.94 per share. Earnings per share almost doubled in three years time to \$5.66 (in 1965 the figure was \$5.47, and in 1964 \$4.51).

Falconbridge and its subsidiaries in 1961 had metal sales and other operating revenues of \$79,052,437 including the large deliveries of nickel at premium prices to the US stockpile. In 1966, Falconbridge, with its subsidiary and associated companies, had net sales of \$225,335,000—an increase of some \$18.7-million (about 9 per cent) over 1965, and of \$146,282,563 (185 per cent) over 1961.

This year, 1967 prospects look even better, and in 1968 even more fruitful. The primary factor: a demand for all the nickel that Falconbridge can produce. By the end of 1967, or at least early in 1968, the nickel operation of Strathcona Mines, the company's largest, will start shipping concentrates that will raise Falconbridge's annual nickel production by one-third—to 100-million pounds. Also under development in Sudbury are two nickel properties, the Longvack South where shaft sinking is in progress, and the Lockerby Mine on which a preliminary development program is soon to start.

In Kristiansand a new chemical and research laboratory and a commercial-size pilot refinery unit are to be completed this year.

Last year, 1966, also saw the purchase and creation of a shipping, receiving, and warehousing link at Thorold, Ontario, on the Welland canal, between the Sudbury mines and smelter with Kristiansand refinery. A bulk cargo vessel is being built (for delivery late 1968) to handle shipments and reduce costs of shipping matte, which until now has been moved by rail to the ports of Montreal and Halifax.

Also involved in the decision to create a North American distribution centre is the need to be competitive and to be able to effect quick delivery of nickel, nickel products, and cobalt to the plants of consumers in the United States. A survey of the market had indicated that as much as 75-80% of all the nickel used in the US was employed in plants located within a 500-mile radius of the Niagara Peninsula.

**What is Falconbridge doing to retain its place as the world's second largest supplier of nickel?**

To assure itself of major sources of nickel, Falconbridge is carrying out an aggressive search for ore, both at its properties in Sudbury and in other parts of Canada and the world. At the Sudbury operations,

**The first five years** since the merger have proved the effectiveness of plans made to rationalize operations.

**The future** is one of hopeful strength, provided outside adverse factors do not get out of hand.

despite extracting over 2-million tons a year of ore, reserves keep on increasing and are at their highest in the history of the company.

One of the foreign ventures now at an advanced stage is the majority-controlled Falconbridge Dominicana, which has a large laterite deposit in the Dominican Republic. Tonnages are reported at over 50-million. A small pilot plant was dismantled last year, after having reached its metallurgical objective, and was replaced by a large-scale pilot plant with a capacity of some 100tons/day of ferro-nickel.

The company is also placing considerable emphasis on Ungava, where it spent \$3-million in preliminary work on its 60% owned New Quebec Raglan property. The former owners, Raglan Nickel Mines, had reported substantial amounts of nickel sulphides plus copper ore on a number of deposits. Although it is too early for Falconbridge to commit itself, both the laterite deposits and the Ungava properties are being considered for eventual major developments.

The nickel belt of Manitoba is being looked at with a great deal of interest, and a substantial amount of exploratory work and diamond drilling is being done in conjunction with other mining groups. Results to date have been quite encouraging, and by the end of 1966 known sulphide occurrences had been sizeably extended.

### Minerals Division

A number of mines had been developed under the Ventures name during the thirty-odd years that it was in existence, but their real importance, apart from United Keno Hill and Giant Yellowknife, had not fully been felt until Falconbridge became involved with them.

Though nickel is still the principal commodity in the growth of Falconbridge, the minerals division has also greatly contributed to the status of the company. In 1962 the market value of Falconbridge holdings in subsidiary and other companies, excluding the wholly-owned non-nickel companies, was \$86,929,000. By the end of 1966 values had risen to almost twice as much at \$170,610,000.

The merger could not have been better timed, as some of the properties of recently-acquired subsidiaries which were being developed or prepared for production started to pay dividends at a time of climbing prices for copper and zinc. First was Kilembe Copper Cobalt the year following the merger. In 1964 Lake Dufault began to produce from its high-grade copper-zinc orebody; the mine has been the most profitable asset acquired at the time of the merger. Last year it returned to Falconbridge \$9,631,000 in earnings after all charges had been paid. The marketable value today,



were Falconbridge to sell its position in the property, would be about \$28-million; Kilembe Copper Cobalt at around \$24-million.

Another company which is paying off handsomely is Opemiska Copper Mines, which started out in 1953 with a small 400ton/day mill. A surprising performer, the concentrating plant capacity was increased three times and is currently processing over 2000tons/day. Last year it produced 44,649,000 lb of copper and brought Falconbridge earnings of \$2,263,000 for its 36.1% interest. Company holdings in Opemiska are worth close to another \$19-million.

In Nicaragua Falconbridge holds 58 per cent interest in La Luz, which operates two mines under the company name: La Luz (gold) and Rosita (copper). Earnings for Falconbridge, after all charges, were \$4,592,000 in 1966. The Falconbridge interest is worth about another \$17-million plus.

The field of industrial minerals is one that is growing at an increasing rate. At the end of 1966, Falconbridge held 71.5 per cent of Industrial Minerals of Canada (IMC) which had net sales during the year of almost \$4.5-million.

IMC, which produces nepheline syenite (used in the glass, ceramics and paint industries), various grades of silica and silica flour, is in an expansionary program. In 1966 this included the acquisition of 4000 acres of ground which contains a large quartzite deposit—IMC bought all the assets of its chief competitor, Simsil Mines Ltd, including a quarry at St Donat, Quebec, and a processing plant at Lachine, Quebec. During 1966 Industrial spent \$567,500 in updating its plants. . . and established a research laboratory at Don Mills, Ontario.

**Iron ore:** Diversification is further illustrated by the company's entry into the iron ore field. Until early 1967 Falconbridge's position was fairly minor, with its revenue limited to shipments of iron oxide produced from the pyrrhotite plant, as a by-product of the nickel operations at Falconbridge, Ont., plus royalty income of \$265,000 obtained from Zeballos Iron Mines in British Columbia. Shipments to the Steel Company of Canada were 100,800tons of iron oxide.

As of this spring; the company has become seriously involved in the production of iron ore concentrates and pellets through its wholly-owned Wesfrob mine, in the Queen Charlotte Islands of British Columbia. The \$40-million development is in its first year of operation to supply iron and copper concentrates to Japan. Contract terms with the Japanese call for a million short tons a year for the next ten years. Production scheduled for 1967 is 637,000 metric tons of iron concentrates and 30,000 short tons of copper concentrates.

Falconbridge's stature as an iron producer will be further enhanced when its contemplated iron recovery plant becomes a reality. The unit, which would operate on material being mined and milled for its nickel-copper content at Falconbridge, would be larger than the existing one and could involve not less than \$50-million. The proposed plant will have enough capacity to handle all pyrrhotite produced during operations, and to recover as a by-product the sulphur content from the process fumes.

**Precious metals:** Among its large holdings, further diversification is shown in the field of precious metals. In addition to the La Luz gold operation and two small gold mines in Rhodesia the company operates Giant Yellowknife Mines (gold) and United Keno Hill Mines (largely silver). Although all are operating profitably,

the arbitrary prices set on these commodities by the US Treasury and the increasing cost of labour and equipment (plus the uncertain supply of sufficient trained personnel) create uncertainties on the future of these operation. Because of these factors Kiena Gold Mines, in Quebec's gold belt, has been placed on a care and maintenance basis. Readied for production, work was suspended in the fall of 1965.

**Other interests:** The assets taken over from Ventures also included Alminex (oil and gas), and Ventron Corporation. Fahrallloy Canada Limited (wholly-owned) and Ventron (42.1%) place Falconbridge in the category of an industrial holding company. The performance of Fahrallloy has shown steady improvement over the years. At end-1966 a new company, Fahrallloy-Wisconsin Limited, was formed to carry on in Canada the same type of Centrifugal casting operations as practised by Wisconsin Centrifugal Inc, at Waukesha, Wis.

**Essentially a mining company,** apart from these industrial holdings, Falconbridge improved its position as such still further by taking a 7.4 per cent interest in McIntyre Porcupine Mines in late 1963. This action turned out to be a sound investment, since it not only added to the Falconbridge portfolio, but it effectively prohibited the control of McIntyre by Power Corporation of Canada Ltd, who had made a bid for an 8% stake in that company. As McIntyre held a measure of control of Falconbridge through its holdings of over 25% of issued capital, the latter was reluctant to see control of McIntyre pass into the hands of a new group that had little experience in mining matters.

In resisting the change in McIntyre's control Falconbridge, in a way, returned a favour to McIntyre which helped Falconbridge when it needed money to facilitate the acquisition of the Ventures interests.

**New Director:** On 3 May 1967, S.M. Wedd resigned as a Falconbridge director and was replaced by Howard B. Keck, president of Superior Oil Co, Houston.

### **The future**

President Horace Fraser, planning far ahead of the Falconbridge-Ventures merger, had started to organize a strong head-office management staff, and in 1962, when Falconbridge became a corporate structure, his plans were put into action: □ The Nickel Division became co-ordinated through a director.

□ The director of Metallurgy and Research set out to co-ordinate and expand the research facilities.

□ A Minerals Division was organized under a vice-president to supervise the non-nickel holdings of the group.

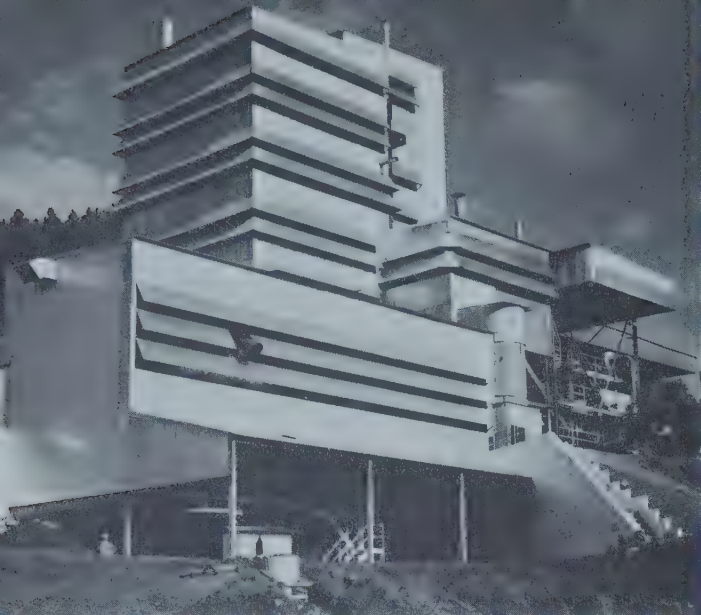
□ Exploration and Geology Division was placed under corporate management.

□ The construction of a Marketing Division was initiated with a vice-president in charge.

**The moves** have in a short time proved immensely beneficial and the organization is putting a plan to further its corporate growth. It has completed, or will have completed, this year two-multi-million dollar projects, both internally financed, and may be on the verge of announcing another.

**Looking ahead** another ten years, net sales could possibly double this year's figures. However, there is always a question mark in making such projections (which could effect other natural resource companies as well). . . and that is: *will the political/industrial climate during that time be detrimental to such growth?*





Dominican Republic: metallurgical pilot plant



Refinery at Kristiansand, Norway

FALCONBRIDGE



## FALCONBRIDGE OPERATIONS

The status of Falconbridge Nickel Mines since its merger with Ventures has far exceeded expectations. Its holdings are becoming increasingly larger and, in general, its mining operations more profitable. With two main exceptions, Fahlralloy Canada and Ventron Corporation (U.S.A.) it has remained essentially a mining company and further diversification has remained within the industry. . . a field which the company knows and for which an extremely capable corporate management team has been built.

Primarily a nickel producer, Falconbridge, in order to improve operating efficiency, has divided the company into a nickel division and a minerals division of which some of the subsidiary companies in either case can be wholly-owned, subsidiaries or associated companies.

### Sudbury Basin Operations

*Producing mines:* Falconbridge, East, Onaping, Hardy, Fecunis, North.

*Under construction:* Strathcona, Longvack South, Lockerby.

*Smelter:* Falconbridge.

*Iron ore recovery plant:* Falconbridge.

**Loading and distribution centre:** Thorold, Ontario.

**Refinery:** Falconbridge Nikkelverk, A/S, Kristiansand S., Norway. **Research laboratories:** Richvale (Thornhill), Lakefield, Falconbridge, Kristiansand.

### Wholly-owned companies:

*Anyox Metals Limited* (property operated by Zeballos Iron Mines Ltd): Properties located on the west coast of Vancouver Island. Royalties in 1966 totalled \$265,000 from the sales of 289,757 metric tons of iron concentrates.

*Fahlralloy Canada Limited:* Manufacturing company specializing in Ni alloy and stainless steel castings. The company recently joined with Wisconsin Centrifugal Inc. of Minnesota to form Fahlralloy-Wisconsin Ltd. for the production of centrifugal castings.

*Westfrob Mines Limited:* Tasu iron-copper mine in the

Queen Charlotte Islands, British Columbia; 25-million tons of 41% Fe ore and 15 million tons of 45% Fe. Includes 7-million tons at 47% Fe and 0.7% Cu.

### Subsidiary and Associated companies

*Acton Limestone Quarries Ltd* (53.9%): Limestone quarrying and crushing operation at Acton, Ontario. Supplies sized rock for the construction industry.

*Alminex Ltd* (51.5%): The oil and gas arm of Falconbridge has substantial interests in Western Canada, Ontario and in three licensed areas in the British sector of the North Sea. The company has recently taken up its option in a 50% interest in Alminex (U.K.) Limited, a wholly-owned subsidiary which held Alminex's 25% interest in the North Sea licenses.

*Delbridge Mines Ltd* (51%): Diamond drilling carried out during the past year indicates a small high grade zinc lens. Underground exploration is to be carried out once the shaft has been unwatered, in order to delimit ore reserves.

*Dominion Magnesium Ltd* (55.2%): Produces magnesium, calcium, and dolomite from one of three large high purity deposits near Haley, Ontario; and refined thorium, titanium from purchased raw materials. Ore is mined by open pit. Production figures for 1967 were: over 7000 tons of magnesium, 18,000 tons of dolomite, plus smaller amounts of the other minerals.

*Giant Yellowknife Mines Ltd* (25.1%): Canada's largest straight gold mining operation continues to be plagued with a lack of skilled miners and increasing production costs. Ore reserves are calculated at 2,133,900 tons grading 0.68oz gold per ton. Exploration and development work being done on adjacent properties is finding ore, somewhat offsetting the decline in Giant's reserves which was down 137,000 tons.

*Industrial Minerals of Canada Ltd:* Nepheline Syenite Division's 1000-ton plant is located at Nephton, Ontario. Mining is by open pit. Silica Division has a sandstone quarry and silica plant at St. Canut, Quebec and another large silica deposit at St Scholastique, 11





Tasu project of Wesfrob Mines, March '67



New Quebec Raglan Mines, Ungava, June '66

**Operations** are divided into nickel and minerals (non-nickel) sectors, backed by research and marketing facilities.

miles from St. Canut. The company is going through an expansionary period and in February 1967 acquired the assets of Simsil Mines Inc., which operated a silica business near Montreal.

**Kiena Gold Mines Ltd** (63.3% Common Shares—100% preferred shares): A developed gold property on a standby basis situated near Malarctic, Quebec. Proven ore stands at 1,542,000tons averaging 0.256oz gold per ton; also 1,225,000tons of probable ore averaging 0.230oz. gold. Work was suspended in the fall of 1965 because of increasing production costs and lack of improvement in price of gold.

**Kilembe Copper Cobalt Ltd** (75.8%): The mine, at the foot of the Ruwenzori Mountain Range, Uganda, Africa, is known to have large deposits of copper sulphide ore. Capacity of concentrator is reported at 65,000tons per month. Smelter capacity is about 1400tons of blister copper per month.

**Lake Dufault Mines Ltd** (51.1%): Falconbridge's most profitable subsidiary, but with a limited amount of ore. Net earnings in 1966 were a record \$18,858,000 from 45,303,000pounds of copper and 75,606,000pounds of zinc. The ore also contains important values in gold, silver and cadmium. The mine, which began operating in August 1964, is considered to be the first in Canada to be engineered around the use of underground transloaders. Surface diamond drilling on a distant section of the property has shown interesting intersections.

**La Luz Mines Limited** (58.3%): A gold-copper producer in northeast Nicaragua which is being operated by underground methods. Mill capacity is 2000tons per day. The wholly-owned Rosita mine is an open pit operation with a plant rated at 500tons per day. Because of the low price of gold the La Luz mine, as with most gold mines everywhere, is just paying its way. Reserves at the Rosita are estimated at 1,279,000tons averaging 3.74% copper with recoverable gold.

**Marbridge Mines Ltd** (50%): A small high-nickel-content operation located in LaMotte township, Quebec.

The property is possibly the only one in Canada that has the distinction of producing millerite in commercial quantity. Mill capacity installed at the Canadian Malarctic plant is about 350tons per day. Reserves are low and an active diamond drilling program is under way to find new ore.

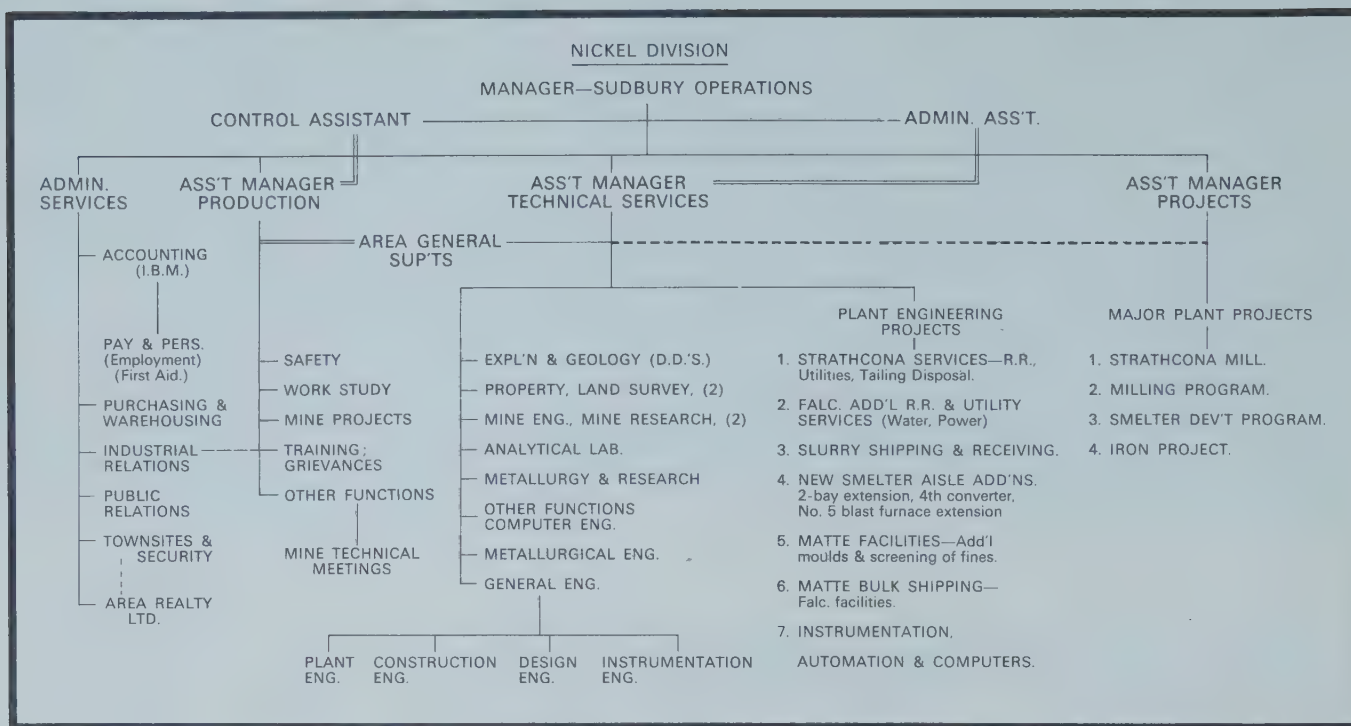
**New Quebec Raglan Mines Ltd** (60%) The property consists of extensive holdings in the Cape Smith-Wakeham Bay area of northern Quebec. An exploration shaft may be sunk this summer on one of the several deposits following an extensive diamond drilling program in 1966. No official estimates of reserves have as yet been released.

**Opemiska Copper Mines (Quebec) Ltd** (36.1%): A most consistent producer in the Chibougamau area of north central Quebec. Copper production, last year, amounted to over 44.5-million pounds of copper along with by-products of gold and silver. Milling capacity is 2000tons per day. The build-up of ore reserves is keeping ahead of production. A substantial amount of development work is being carried out and the main shaft is being deepened to 3400feet to provide eight new working levels. A new 1300ft production shaft is being sunk on what will be known as the Robitaille Mine.

**United Keno Hill Mines Ltd** (48.4%): Canada's largest straight silver mine (4,235,000oz along with substantial amounts of lead and zinc is finding the shortage of labour a difficult situation to cope with. Consequently exploration work to build up reserves has been drastically reduced. Unless the situation is improved the operation may have to shut down within the next two years.

**Ventron Corporation** (44.8%): Formerly Metal Hydrides Incorporated, the company deals with metal powders, high energy release hydrides, and inorganic and organometallic research chemicals. Through a series of amalgamations, Ventron has expanded into scientific and electronic equipment, remote control systems. Plants are located at Beverly and Danvers, Massachusetts.

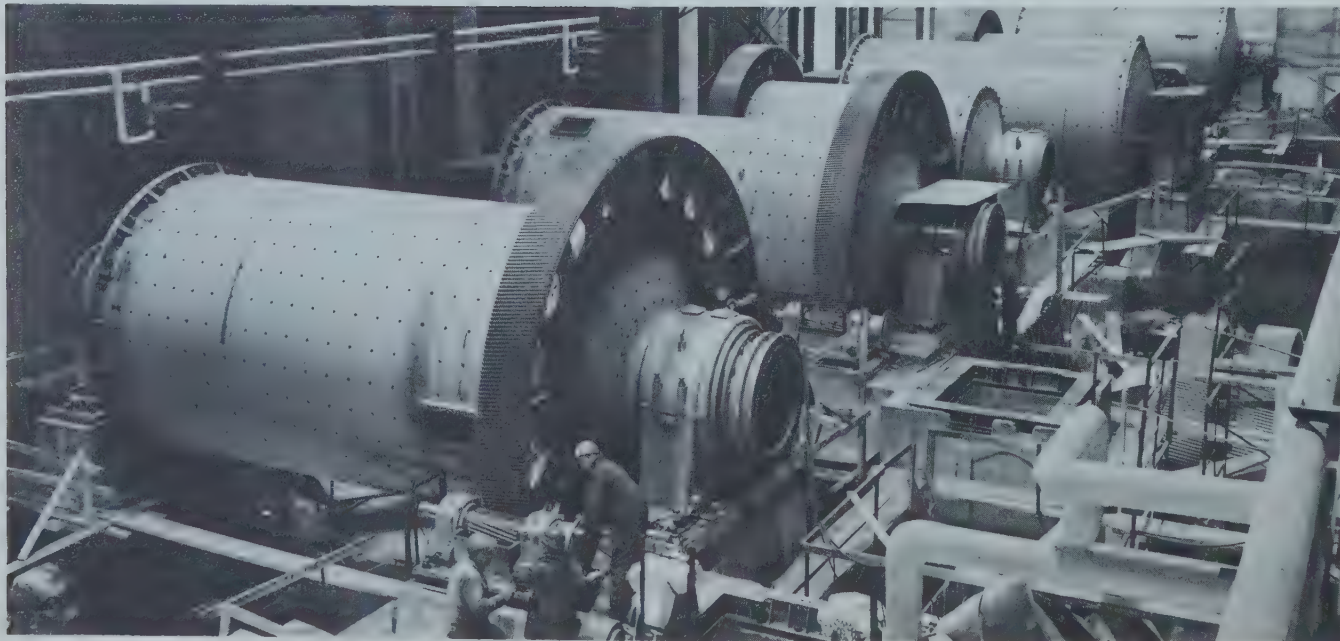




Sorting nickel at Kristiansand refinery



Strathcona mill during construction





FALCONBRIDGE



# HOW NICKEL DIVISION WORKS

**From the older management** came a bit of informality that helps get things done.

**All have a chance** to be heard, and no worthwhile ideas are lost in a maze.

As the history of the formation of Falconbridge Nickel Mines dates back to only ten years prior to World War II, many of those who took part in the early development still have some say in the company's activities. In the transition of corporate direction from the earlier management to those currently directing the company's affairs, much of the informality by which the work was carried out in the formative years is still evident.

## **Informality a plus factor**

There has been a long and close relationship among the senior people of the nickel division, including those at the head office in Toronto. Work at that level is carried out with a minimum of formality, and decision-making resembles the outcome of a family discussion. This is possibly the secret of the growth and the success of the nickel division, which involves close co-ordination between development, mine production, smelting and refining.

The line of demarcation is not clearly defined and at this time there is question whether management would want it otherwise. The informality under which senior personnel work has created a tightly knit group with technical and operational personnel closely complementing each other.

Furthermore, management's thinking is on the theory that major problems are more quickly solved when senior people can be reached by those in the lower echelons, whether technical or operational.

## **System promotes ideas**

The strength in the arrangement is that an idea that has merit, even one that is promoted by junior technicians, will not get killed if his counterpart is against it. Conversely the same applies to an operator in need of technical help, or if he wishes to promote his own thinking. If the introducer feels strongly about his idea, he can move to the next highest level and theoretically right up to the manager, and as the organization is carried through to the head office, all the way to Toronto.

This is accomplished by the somewhat unusual arrangement of a parallel staff-line organization which is aimed to bring the very best technical service to the operating people in either the mines or the plants. The

system also, in effect, gives the operators more freedom from administrative duties so as to allow them the opportunities to improve the efficiencies of their departments.

Built up since the merger, the system has been working exceptionally well. However, the company is careful to admit that it is only as good as the personnel, who must have a willingness to work together and argue out their differences of opinion. Falconbridge also states that many of the accomplishments which have taken place in the nickel division can be directly attributable to this type of entente.

Work between the nickel production operations, including the smelter, and the refinery at Kristiansand, is co-ordinated by E.L. Healy, vice-president, Nickel Division, who receives support at head office from the following technical groups: geological, mining, metallurgical and general engineering. The general manager of the nickel division is D. R. Lochhead. G.A. Allen is manager of Sudbury Operations, and R. Jahnsen is manager of the refinery in Norway.

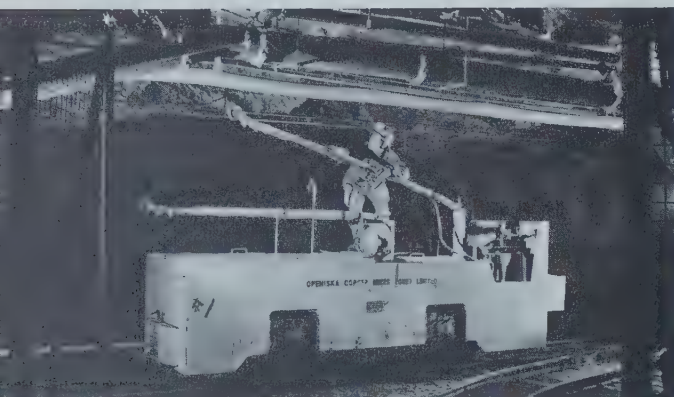
Headframe at Strathcona during construction







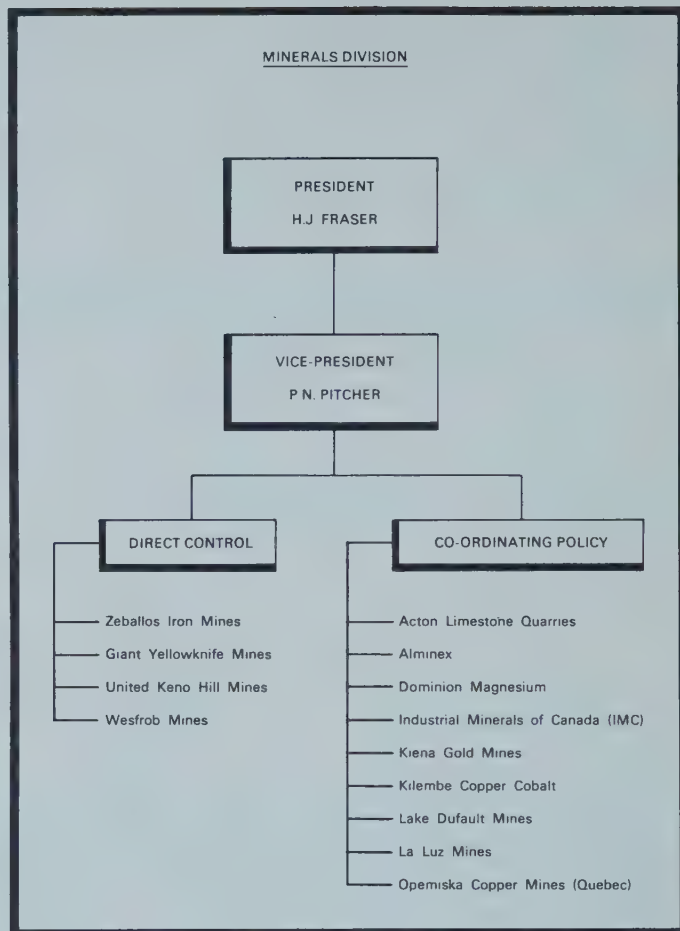
Lake Dufault Mines (copper, zinc)



Opemiska Copper Mines (Quebec)



Rosita open pit mine, Nicaragua (copper)



Scaling at La Luz mine, Nicaragua

Kilembe Copper Cobalt, Uganda





FALCONBRIDGE



## MINERALS DIVISION'S SCOPE

**Non-nickel operations** are co-ordinated within the minerals division.

**Latest technical know-how** is available to the world-wide projects involved.

In undertaking to participate actively in the non-nickel sector of the Falconbridge holdings (wholly-owned, subsidiary, and affiliated), the minerals division was established to give policy direction and to participate in the active management of these properties.

Not only does it make sense from an administrative standpoint, but because of the great distances involved (the extremes of Canada, Africa, Latin America) it provides a means of keeping continuously in touch with operations.

Because each mine has its own special problems in finding the most efficient way of extracting ore, or because of metallurgical complexities and other factors such as peculiarities of rock types and ground control, and in engineering *per se*, the economics of the operations can be enhanced through a central management organization with the backing of a widely experienced technical staff.

P.N. Pitcher, as vice-president of the minerals division, is the co-ordinator of policy decisions affecting operations and of services available from head office to the non-nickel producing companies. These services include engineering, metallurgy/research, exploration department, and so forth. This body of consultants, while keeping track of the latest theoretical developments in their fields, provides practical experience to solving current problems in the production and processing of ores.

The vice-president's role involves the appraisal of new properties or an exploration bet, once ore has been indicated. When services such as engineering, research, and geological appraisal are required from the head office teams, the companies concerned are required to pay a very nominal consulting fee.

For operations in Quebec, Mr. Pitcher is supported by J.P. Millenbach who acts as president of several companies: Opemiska Copper, Lake Dufault, Kiena Gold Mines, and Canadian Malartic.

**Companies involved** in the minerals division are outlined in the coverage of the Falconbridge operations that starts on page 27.



United Keno Hill (silver)



Giant Yellowknife Mines (gold)

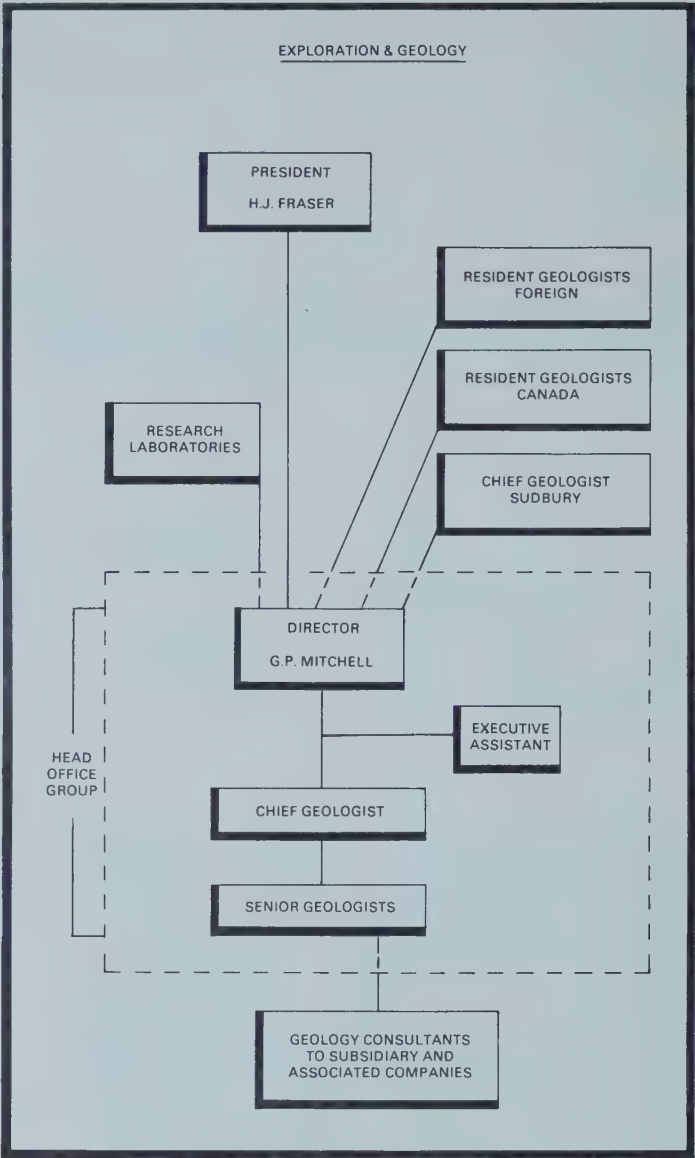
Zeballos Iron Mines, BC







Diamond drilling, La Luz property, Nicaragua



Teamwork by Sudbury Basin geologists



Mineralogical ore examination at Lakefield Research laboratories



FALCONBRIDGE



## GEOLOGY DEPARTMENT INHERITED

**Geology division** is expanded and aids discovery of potential producers.

**Specialists** become involved and new exploration tools are employed.

Where Falconbridge had been searching mainly for nickel-bearing ores prior to the merger, the company acquired from Ventures not only a large inventory of properties in the producing and prospect stage, covering a great variety of minerals, but also an exploration department built up by Ventures. Until then Ventures exploration in Canada and elsewhere had been carried out from Toronto and strategically located regional offices under the direction of the chief geologist, Dr. A. S. Dadson.

The immediate result of the merger was that the exploration programs of the merged companies were placed on a broader basis than in either company prior to the merger. Consequently an expansion of the geological department took place which, in effect, co-ordinated all exploratory functions of Falconbridge and its subsidiaries under the direction of G. P. Mitchell, Director of Exploration and Geology. Dr. Dadson remained in his position as Chief Geologist.

Since then the new department has been connected with the development of the Norbec ore body of Lake Dufault Mines, Falconbridge's most lucrative copper and zinc producer; Kiena Gold Mines, a large partly developed gold deposit which is being kept on a standby basis; Wesfrob Mines; and most recently, Delbridge Mines, a base-metal/precious-metal prospect, not too distant from Lake Dufault's operation.

Apart from the head office and Sudbury, field offices, some larger than others, are situated in Montreal and Noranda, Quebec; Port Arthur, Ontario; Winnipeg and The Pas, Manitoba; and Vancouver. Each of these has one or more geologists and sometimes a prospector and a geophysicist who all report back to the chief geologist in Toronto. The geological department roams far afield and foreign offices are established in the Dominican Republic; Kristiansand, Norway; Switzerland; and Africa.

Exploratory work pertaining to nickel in the Sudbury area comes under the chief geologist, A. M. Clarke, who reports administratively to the manager of operations and technically to Toronto's G. P. Mitchell. Consultations on special geological situations is co-ordinated directly with the head office.

Concerning the associated or subsidiary companies, the resident geologists report to the manager of the particular operations. Consultants from the head office staff keep liaison and offer advice if problems occur.

**Supporting the consulting geologists** are a chief geophysicist and a chief geochemist. The staff of the former is not large but with the many good consulting geophysical services available from outside firms, Falconbridge considers it more economical to hire them as the necessity arises. A new geochemical office was recently opened in Vancouver, separate from the main Vancouver office. Geochemical work is carried out not only for the British Columbia group, but for the other field parties distributed throughout Canada.

There are over eighty geologists working for Falconbridge including the head office, the nickel operations in Sudbury, subsidiary and associated companies. Falconbridge exploration expenditures are high, spending \$4-million in 1965 and \$7-million in 1966 with the increase being attributed to work done on the properties of New Quebec Raglan Mines. A substantial amount of money was also spent, last year, in a continuing exploration program within the Manitoba nickel belt in the Wabowden area, where nickel prospects are under investigation.

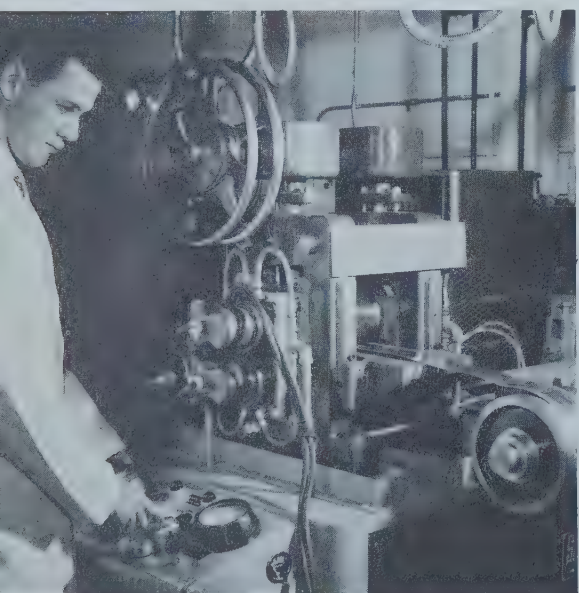
Geologist examining core





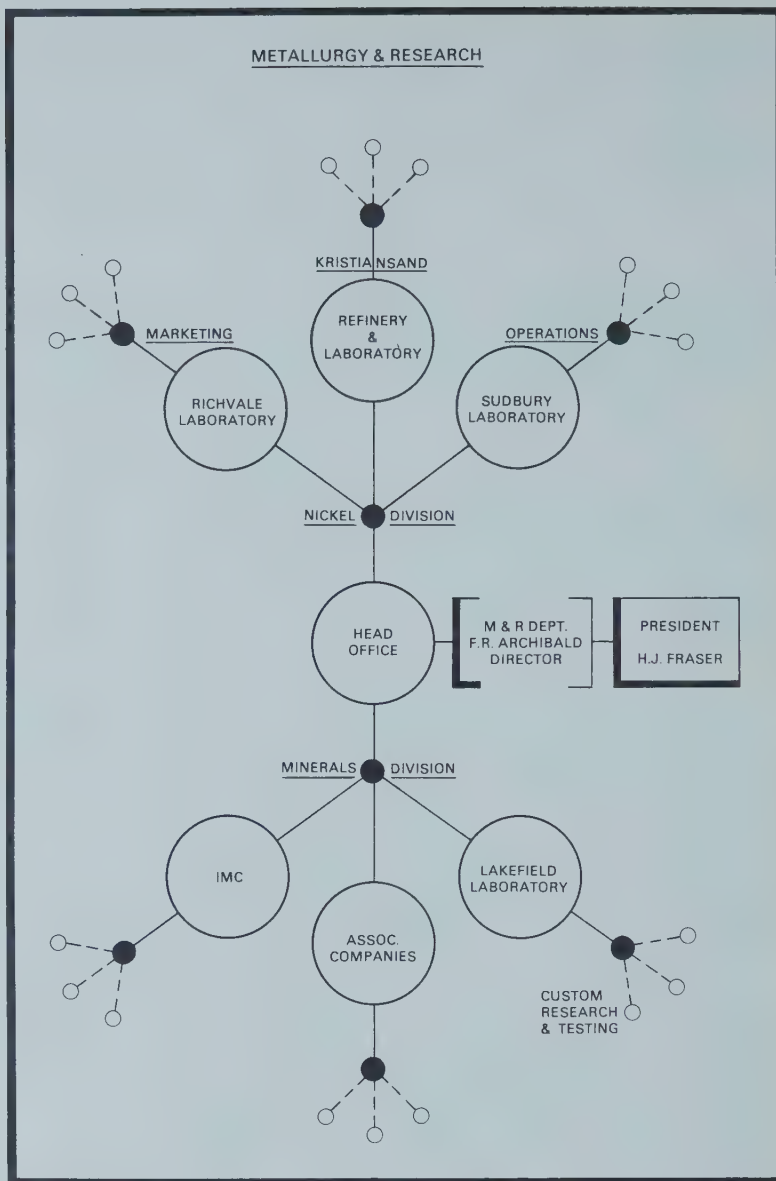
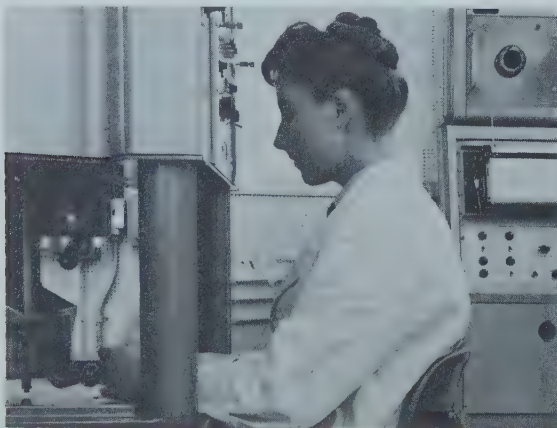


Vibrating mill reduces ore for extraction metal-lurgy studies at Richvale laboratories



Minature rolling mill in physical metallurgy sec-tion of Richvale research centre

Vacuum X-ray quantometer for analyses



Crushing ore samples, Lakefield Research





FALCONBRIDGE



# RESEARCH-ORIENTED COMPANY

**Research and development** involve a number of departments.

**Four major units** carry out sustained research programs.

At Falconbridge, research signifies progress — on the side of extractive metallurgy and production, new and improved processes, maximum recovery of all possible ore values — and reflection of such progress in improved efficiency and costs. On the other side, involving technology of products and uses, emphasis is placed on quality, on specific application and on co-operative research with customers and universities, leading to technical contributions of general worth in the field.

## **Current R&D operations**

Development work to meet existing problems and improve practical operations is carried out at the actual mine and mill sites of the Falconbridge nickel operations.

Specialized and longer-ranged research problems are removed from the atmosphere of the producing units, at which the demands of current problems tend to discourage the continuity of thought essential to sustained research. The main research and development work for the group is therefore centralized in four units: (1) Richvale, Ontario; (2) Falconbridge, Ontario; (3) Kristiansand, Norway; (4) Lakefield, Ontario.

Richvale is the principal research centre, known as Falconbridge Metallurgical Laboratories, recently enlarged to a \$1.5-million complex. Work here is designed to keep pace with and anticipate technological developments in the industry. Laboratories are equipped with the most modern facilities for research in extractive and physical metallurgy, and in products, and mineralogical investigations. This work tends to be related towards the group's marketing operations.

The Falconbridge centre is closer to current production and processing needs and development.

Kristiansand is the site of the Falconbridge Nikkelverk A/S refinery where matte is refined and the metal produced. Research here is naturally more on the metallurgical side; for example, for quality improvement and control in refining matte, and in the electrodeposition of nickel, copper and cobalt. The basic concept is the production of primary metal materials of high quality with efficiency and economy.

Lakefield Research of Canada Limited is a wholly-owned subsidiary of Falconbridge that operates as a commercial organization specializing in mineral pro-

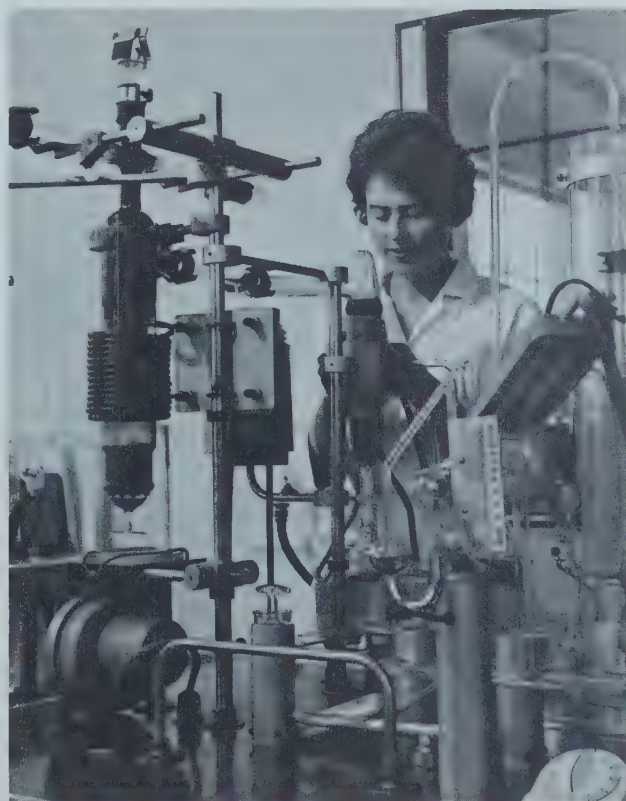
cessing research, and flowsheet development. The facilities are available to industry on a custom basis, as well as for the Falconbridge group.

**Controlling research departments** At the centre of, and controlling, the various research centres, is the metallurgical and research department, located at head office but available for consultation at any of the other units for advice and guidance on milling and other metallurgical problems.

Similar backing is provided by the general engineering department on plant construction and equipment installation, and by the mining and engineering research department on the various facets of mine operation, this being related to the mine research department at the Sudbury nickel operations.

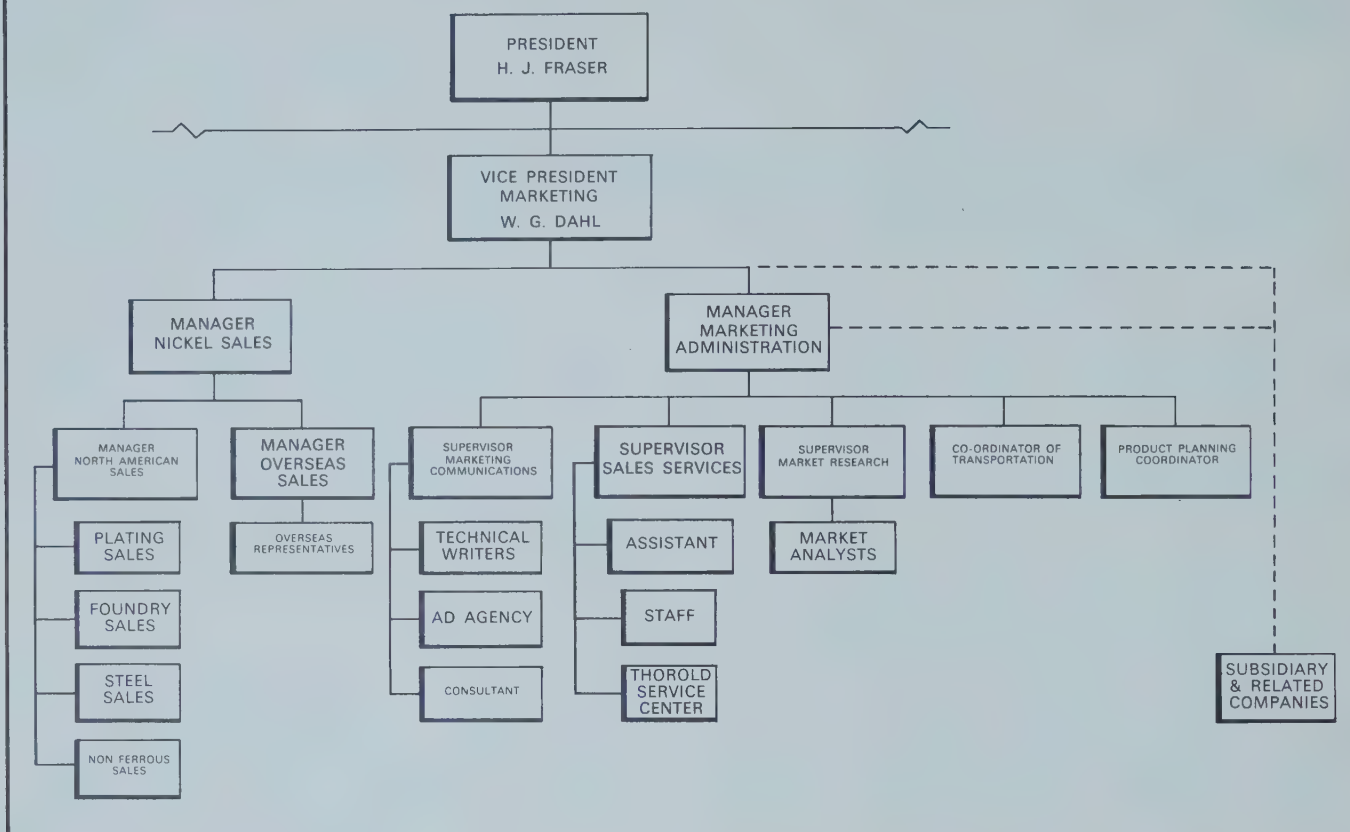
To complete the overall scope of the R&D field, the exploration and geology department at head office is assisted by the Richvale and Falconbridge laboratories in solving geological problems and in applying new techniques in the earth sciences to finding and evaluating economic mineral deposits.

A Kristiansand research laboratory





## MARKETING DIVISION



Tank house at Kristiansand refinery



Trainees and graduate—Uganda





FALCONBRIDGE



# MARKETING DIVISION GROWING

**Marketing** and sales co-ordination work requires top personnel.

**Product development** is directed toward greater sales volume, new markets.

Falconbridge is geared for growth and, at a time of unprecedented demand for nickel, the company, as the world's second largest producer of nickel metal, is out to expand its sales of the metal, especially in the potentially more lucrative U.S. market.

The largest portion of Falconbridge's customers are in Europe, influenced to a great extent by the proximity of the refinery at Kristiansand, Norway. Current sales to the U.S. amount only to about a third of the company's total production, and it is to the newly organized marketing division under W.G. Dahl that Falconbridge is looking for inroads into an area that has been largely controlled by International Nickel Company of Canada.

But it is not only in the sale of nickel in its various forms that the marketing division is important to the future of Falconbridge. Copper, zinc, iron, cobalt, silica, magnesium, among many other products, are produced by affiliated companies, and increased profits for them mean improved dividends for the parent company. The marketing division is intended as staff support for all these activities, as needed.

## Staff development

The marketing division, as an integrated unit, is less than three years old. The forerunner consisted of four persons who administered the U.S. stockpile shipments and sold the remainder to the consumer market.

A careful analysis, made in 1964 and since updated, on the growth pattern and the long-range requirements of the nickel market, resulted in a 15-year marketing plan. A plan, however, is efficient only if there is an organization to put it into motion and a search was initiated to find people of a calibre that could accept responsibility and adjust to conditions and the environment of Falconbridge. To date, almost a dozen have been appointed. The marketing group is young, averaging 35 years, many members having a combination of technical and business background with a minimum of five years of marketing.

Coinciding with the development of the marketing group is the building up of sales representatives in various parts of the world so that they can get into gear with the marketing organization at the head office. Through sales offices serving 28 countries, Falconbridge is in a position now where it can serve the

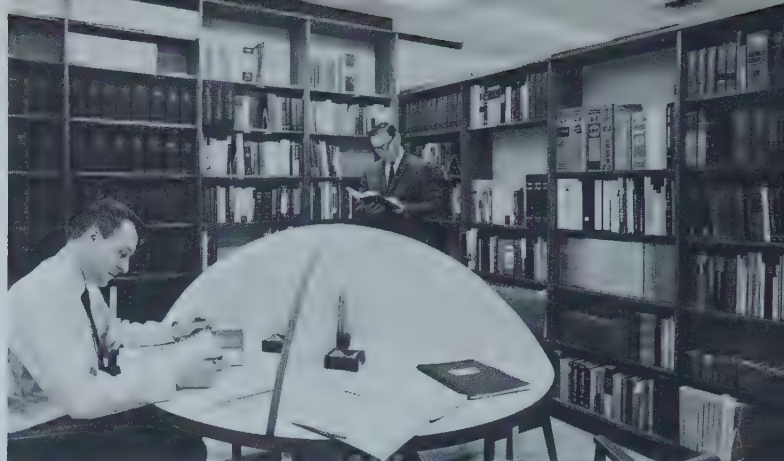
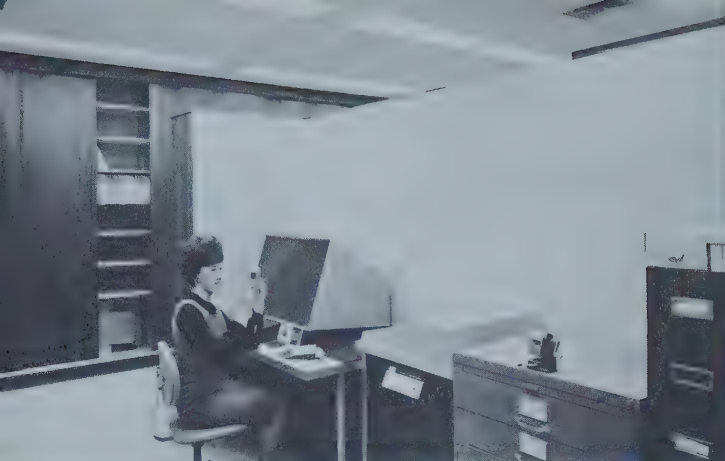
world markets plus the many metal and mineral commodities with which it is associated.

Dahl says that the organization has not yet had to face the acid test when commodities are hard to sell. "The philosophy behind the organization," he states, "is to sell directly, or through representatives, to the consumers, and to keep the inventories to a marketable level . . . and in case of a buyer's market, to have the organization, the worldwide market image, and all the skills needed to sell very hard."



First copies of the company's new Trade Mark Manual are examined here by W.G. Dahl, Vice-President—Marketing; H.L. Hickey, Manager—Public Relations; and H.J. Fraser, President and Managing Director, who has expressed the company's outlook: "Falconbridge has embarked on a long-range program of graphic communications designed to promote the visual appearance of our companies to the point where it will enjoy instant recognition world-wide. We have initiated this program with the introduction of a new Falconbridge Trade Mark, the basis of an emerging 'new look' throughout the organization."





FALCONBRIDGE



# FALCONBRIDGE INFORMATION CENTRE

**How its own information centre was established by Falconbridge Nickel Mines Limited; the facilities and how the system works**

**This is the first known organization in Canada to produce regularly a KWIC index for 'in-house' data storage/retrieval/dissemination**

Due to expanded operations resulting from the Falconbridge/Ventures merger in 1962, the need for an Information Centre at the Toronto head office of Falconbridge Nickel Mines Limited was confirmed during 1963. The Company required a central depository in which essential information, technical and non-technical, could be coded, stored and subsequently retrieved on a self-service basis. By early 1967 such a service had been implemented and is now functioning smoothly.

Work commenced in January 1964 when four little-used internal storage rooms and adjoining corridor were cleared to provide an area 36ft×16ft6in. ×8ft6in. All available space within these limits was utilized to provide maximum facilities.

## Facilities

Storage facilities for loose-leaf information such as technical papers, journal articles, etc. consist of seven shelves, each 36ft long, 10in. apart. These run

full wall length with total storage area for 25,000 coded information files. Beneath these shelves is a space 36ft×2ft 8in. for the storage of literature produced by the Public Relations and Marketing divisions. The entire area is concealed by nine full-length (ceiling-to-floor) sliding doors.

Bookshelves totalling 251ft permit storage and display of approximately 2500 books, while a cruciform type rack enables twelve monthly issues of 160 magazines and journals to be displayed. Back issues are subsequently bound and placed on bookshelves.

A partitioned round table (5ft diameter) enables four persons to read or study simultaneously.

As microfilm plays a large part in any efficient storage and retrieval operation, the Falconbridge Information Centre has been equipped with an 18x24 Itek reader printer and a dryer, together with microfilm and microcard reader for all microfilming requirements. A portable 16mm camera handles all simple microfilming,

while larger and more complicated filming in 35 mm is serviced by Recordak.

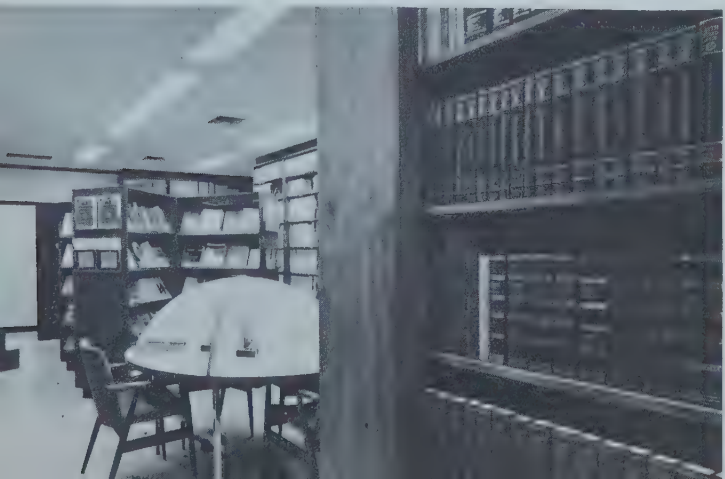
An "L" shaped desk, length 15ft10in and depth of 2ft is built into one end of the centre, with typing and 'under-desk' storage facilities for two assistants.

All woodwork in the Centre is finished in matching walnut veneer.

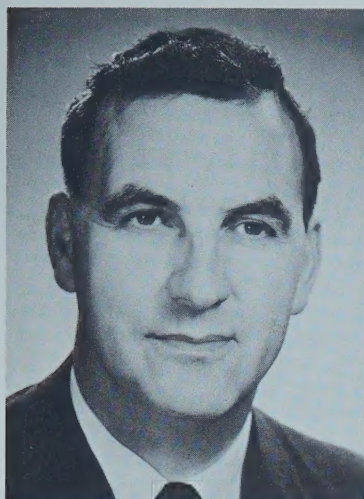
## The System

Many information storage and retrieval systems were studied. Special attention was given to those which could be commenced on a manual basis with catalogue and keyword cards and subsequently automated without difficulty.

EJC (Engineers Joint Council) coordinate indexing without the use of links and rolls was favoured. As the entire system was designed for and dependent upon 'in-house' contributions, an experimental input memo was designed on 8in×5in cards and distributed throughout the organization (see Fig 1).







by Stewart Collett

Supervisor, Falconbridge Information Centre

In April 1964 the first input memos were returned to the Information Centre and by December 1965 a total of 3500 had been documented and stored.

Manual searching and matching of keyword cards however proved to be a difficult and time-consuming task and greatly hindered 'self-service'. Much of the information retrieval had to be handled by the Information Centre staff rather than personally by the searcher. It was also impossible to distribute an index of all the material available in the system due to the constantly increasing volume.

A study was therefore made of the existing automated systems and KWIC (Keyword in Context) appeared to be ideal for Falconbridge purposes, although not in its usual 'wrap-around' format. Satisfactory refinements to this

system were made with the assistance of IBM Toronto, and a program was custom-built to Falconbridge requirements.

From the 3500-plus inputs already in the system, a detailed thesaurus or 'Keydex' was developed and distributed to all areas of the organization. The input-memo, now truly tested and found to be highly successful, was revised to accommodate the KWIC title (Fig 2) and the task of transferring all the information to keypunch cards began.

The transfer was completed within six months, and the first computer printout of the KWIC Index and Abstract sections was made in September 1966. This was basically a trial edition, subject to final editing and any improvements thought necessary. Copies of both sections were distributed to Company personnel throughout Canada and abroad.

Fig. 1

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Fig. 2

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## INFORMATION CENTRE

At that point, the potential of a system which could co-ordinate all company-wide information, document and distribute it in book form by subject matter was immediately apparent. Inputs to the system could be made by individual staff members or by departments as group entries. The KWIC Index was flexible enough to permit the entry of any subject matter provided fitting keywords from the company-compiled thesaurus were selected. Between the September 1966 printout and February 1967, the number of inputs received from staff members brought the total to an excess of 6000.

The second edition - fully edited and with few modifications - was printed out during the first week of March 1967 and an extract from both sections is shown in Fig 3.

Keywords contained in any KWIC title have been restricted to a maximum of five, except where necessary to exceed in order to adequately code a voluminous article.

Supplements to both sections are printed out monthly, and a bi-annual reprint of the entire KWIC Index Section incorporates the five previous monthly supplements.

Company Confidential material received is recorded with the code 'CC'. Name of the contributor of such information is also recorded and if retrieval is required, clearance from the contributor is requested before release is granted. Head Office personnel requiring information other than Confidential simply note the number(s) required, retrieve direct and sign out on Centre records, while personnel at all other locations write or telephone to request photocopies of specific file numbers. Returned files are deposited in trays for refiling by Centre staff.

It is interesting to note the manner in which the KWIC system at Falconbridge has been utilized by individuals. While some staff members contribute valuable and important information into the system for the express purpose of retrieving that same information at a later date, others contribute with the

knowledge that they will be able to retrieve not only that particular information, but also all other contributions in that field. One department - Mining Engineering and Research - uses in addition to regular keywords, a 'departmental keyword' which is applied to all its inputs. When printed out, all these inputs appear under the departmental heading and are then photo-copied for dissemination to others in the field, thereby keeping them fully advised on 'state-of-the-art' and other important developments in their field of endeavour.

Immediate future plans include the development of a comprehensive KWIC author-index, a self-contained KWIC patent-index, and absorption of the balance of information held at the library of Falconbridge Metallurgical Laboratories at Thornhill, Ontario.

With the completion of these projects, an invaluable information service will have been established and the original concept of the Falconbridge Information Centre fully realized.

FALCONBRIDGE



Fig. 3 (Abstract Section) 000519

Fig. 3 (Index Section)

MAGMA-COPPER-CO  
CONCRETE-PLACERS PNEUMATIC/PLACING/OF CONCRETE SAN-MANUEL-MINE  
MAGMA-COPPER-CO MIN-ENG-AND-RES. 006061

MAGMATIC-ROCKS  
MAGMATISM/URALS/ULTRAMAFIC PETROGENESIS MAGMATIC-ROCKS USSR  
ULTRAMAFIC-ROCKS. 005754

MAGN-PARTICLE-TSTNG  
QUALITY FORGINGS ASSURED/BY NONDESTRUCTIVE-TSTNG MAGN-PARTICLE-TSTNG  
ULTRASONICS. 000418  
MAGN-PARTICLE-TSTNG INDICATIONS/IN MALLEABLE-IRON. 001502  
ULTRASONIC-TESTING MAGN-PARTICLE-TSTNG OF CASTINGS. 003015

MAGNAFLUX-CO  
ZYGLO ZYGLO-PENTREX MAGNAFLUX-CO. 002374

MAGNEGAGE  
MAGNEGAGE FOR THICKNESS MEASUREMENT COATING AMER-INSTRUMENT-CO. 002373

MAGNESIA  
PHASE-DIAGRAMS OF IRON-OXIDE AND MAGNESIA. 001361  
IRON-OXIDE SILICA PHASE-DIAGRAMS MAGNESIUM-OXIDE MAGNESIA. 005931

MAGNESIA-SILICA-STM  
STABILITY/OF/THE MAGNESIA-SILICA-STM METASILICATES. 001364  
PHASE-DIAGRAMS OF/THE MAGNESIA-SILICA-STM AT/HIGH/  
TEMPERATURES/AND/PRESSURES. 001405

MAGNESIUM  
EFFECT/OF/MAGNESIUM ON ALUMINIUM-ALLOYS FOR/CASTING. 000522  
PHASE-DIAGRAMS OF ALUMINIUM-ALLOYS WITH MAGNESIUM AND SILICON. 000523

STRENGTH/OF/TYPE/354 ALUMINIUM-ALLOYS WITH SILICON MAGNESIUM AND  
COPPER. 000531

AN/ECONOMIC/AND/TECHNICAL/EVALUATION/ OF MAGNESIUM  
PRODUCTION/METHODS/IN/THREE/PARTS/1/ METALLOTHERMIC PIDGEON-PROCESS. 000850

STRUCTURE/AND PHASE-DIAGRAMS OF NICKEL-ALLOYS WITH MAGNESIUM AND BORON  
BORIDES. 000849

THERMODYNAMIC/DATA/ON MAGNESIUM AND IRON-OXIDE. 001365

MAGNESIUM THERMO-REDUCTION PROCESS VACUUM-DISTILLATION FERROSILICON. 001506

MAGNESIUM-CHLORIDE BY/PRODUCT/FROM EVAPORITES MAGNESIUM/ SOURCE. 001508

FATIGUE BEHAVIOUR/IN SHEAR OF ORIENTED MAGNESIUM SINGLE-CRYSTALS. 001670

HOT-ROLLING AND/MECHANICAL/PROPERTIES/OF/MAGNESIUM/  
ALUMINIUM-ALLOYS/WITH/9.5%/ALUMINIUM MAGNESIUM-ALLOYS  
ALUMINIUM-ALLOYS. 001880

POLAROGRAPHY ALUMINIUM MAGNESIUM ROCKS. 002425

MAGNESIUM PRODUCTION. 002434

CALCIUM MAGNESIUM ATOMIC-ABSORPTION SPECTROMETRY. 002869

PATENTS MAGNESIUM METHOD/OF/PRODUCING DCAL. 003301

USE/OF MAGNESIUM AND MAGNESIUM-ALLOYS IN/CANADIAN/MINING/  
EXPLORATION/AND/DEVELOPMENT DRILLING MIN-ENG-AND-RES. 003768

MECHANICAL TUBING STEEL ALUMINIUM COPPER NICKEL MAGNESIUM TITANIUM. 003958

ELECTROPLATING MAGNESIUM. 004527

FAILURE IN/CENTRIFUGALLY/CAST RETORTS USED/IN MAGNESIUM PRODUCTION.

THE EFFECT OF DEFORMATION AND RECOVERY ON THE SUBSEQUENT  
RESISTIVITY INCREASE IN COLD-WORKED CADMIUM.  
EFFECT/OF/DEFORMATION/AND/RECOVERY/ON ELEC-RESISTIVITY  
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DOPED CADMIUM HAVE YIELDED AN OPPORTUNITY FOR PERFORMING  
EXPERIMENTS ON THIS HEXAGONAL METAL. IT IS THE PURPOSE OF  
THIS MANUSCRIPT TO DESCRIBE THESE RESULTS AND PRESENT  
REASONS WHY CADMIUM BEHAVES DIFFERENTLY THAN COPPER.

EFFECT OF LONG-TIME CREEP ON STRUCTURAL SHEET MATERIALS.  
EFFECT/OF/LONG/TIME CREEP ON/STRUCTURAL/SHEET/MATERIALS  
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RESISTIVITY WITH TEMPERATURE WERE MEASURED ON AGED SURFACES  
OF TANTALUM, NIOBIUM, AND TUNGSTEN IN A VACUUM OVER A  
TEMPERATURE RANGE FROM 100 K TO 300 K SUBJECT TO THE  
MATERIAL.

TYPE ALUMINIUM CASTING ALLOY. PART I. EFFECT OF MAGNESIUM  
CONCENTRATION.  
EFFECT/OF/MAGNESIUM ON ALUMINIUM-ALLOYS FOR/CASTING.  
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INVESTIGATION WAS CONDUCTED TO DETERMINE THE EFFECT OF  
PROPERTIES AND PART STRENGTHS OF HIGH PURITY 356-T6 TYPE  
ALUMINIUM ALLOYS.

PRELIMINARY EXPLORATION OF THE ALUMINIUM-SILICON-MAGNESIUM  
ALLOY SYSTEM. PART I.  
PHASE-DIAGRAMS OF ALUMINIUM-ALLOYS WITH MAGNESIUM AND  
SILICON.  
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THIS REPORT OUTLINES THE EVOLUTION OF CAST 356-T6 TYPE  
ALUMINIUM ALLOYS.

MEGACYCLE DAMPING AND THE ELASTIC STIFFNESS COEFFICIENTS OF  
SINGLE CRYSTAL AND POLYCRYSTALLINE ARMCO IRON FROM ROOM  
TEMPERATURE TO 400 DEGREES C.  
MEGACYCLE-DAMPING/AND/ELASTIC/STIFFNESS/COEFFICIENTS/OF  
SINGLE-CRYSTALS ARMCO-IRON ROOM/TEMPERATURE/TO/400/  
DEGREES/C.  
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A.E. LORD THE MEGACYCLE, PULSE-ECHO INTERNAL FRICTION  
METHOD HAS BEEN USED TO MEASURE CARBON AND NITROGEN SNOOK  
DAMPING PEAKS ON A ALPHA-IRON IN THE TEMPERATURE RANGE  
300 TO 400 C. THE DIFFUSION COEFFICIENT OF NITROGEN AT 326  
C SO DETERMINED WAS IN GOOD AGREEMENT WITH THE COEFFICIENT  
DETERMINED BY A BULK DESCRIPTION METHOD.







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